

## WE CLAIM:

1. A method for serial data transmission between a position measuring system and a processing unit, comprising:

transmitting position data and further data between said position  
measuring system and said processing unit in serial form as digital data words;  
transmitting up-to-date position data between said position measuring  
system and said processing unit upon transmission of a position request command; and  
always transmitting further data, whose processing is not time-critical,  
immediately following said transmitting said up-to-date position data.

2. The method in accordance with claim 1, wherein said further data is  
transmitted from said position measuring system to said processing unit.

3. The method in accordance with claim 1, further comprising transmitting  
a position request command for requesting said up-to-date position data; and  
always transmitting immediately following said position request  
command, further data, whose processing is not time-critical.

4. The method in accordance with claim 3, wherein said further data is  
transmitted from said processing unit to said position measuring system.

5. The method in accordance with claim 1, further comprising transmitting  
said up-to-date position data and said position request command in the form of digital  
data words of a predetermined word length, or as data packets comprising digital data  
words.

6. The method in accordance with claim 3, further comprising transmitting  
said up-to-date position data and said position request command in the form of digital  
data words of a predetermined word length, or as data packets comprising digital data  
words.

7. The method in accordance with claim 1, further comprising transmitting additional non-time-critical data in the form of digital data words of a predetermined word length, or as data packets comprising digital data words.

5 8. The method in accordance with claim 7, wherein said additional non-time-critical data comprises additional data and additional data commands.

9. The method in accordance with claim 3, further comprising transmitting additional non-time-critical data in the form of digital data words of a predetermined word length, or as data packets comprising digital data words.

10 10. The method in accordance with claim 9, wherein said additional non-time-critical data comprises additional data and additional data commands.

11. The method in accordance with claim 1, further comprising:  
having a position request signal arrive in said processing unit during said transmission of non-time-critical data;  
interrupting said transmission of said non-time-critical data;  
immediately transmitting a position data request command to said position measuring system in the place of said non-time-critical data, whereupon said up-to-date position data are immediately transmitted from said position measuring system to said processing unit.

12. The method in accordance with claim 3, further comprising:  
25 having a position request signal arrive in said processing unit during said transmission of non-time-critical data;  
interrupting said transmission of said non-time-critical data;  
immediately transmitting a position data request command to said position measuring system in the place of said non-time-critical data, whereupon said up-to-date position data are immediately transmitted from said position measuring system to said processing unit.

13. The method in accordance with claim 11, wherein said interrupting said transmission of said non-time-critical data is completed at a later time after said up-to-date position data has been completely transmitted by said position measuring system to said processing unit.

14. The method in accordance with claim 1, further comprising interrupting said transmission of said non-time-critical data when a position request command arrives in said position measuring system during said transmission of non-time-critical data; and

transmitting said up-to-date position data to said position measuring system in place of said non-time-critical data.

15. The method in accordance with claim 3, further comprising interrupting said transmission of said non-time-critical data when a position request command arrives in said position measuring system during said transmission of non-time-critical data; and

transmitting said up-to-date position data to said position measuring system in place of said non-time-critical data.

16. The method in accordance with claim 3, wherein all data transmitted between said position measuring system and said processing unit are transmitted over a common data channel.

17. The method in accordance with claim 3, wherein data transmitted from said position measuring system to said processing unit are transmitted via a first data channel, and said data transmitted from said processing unit to said position measuring system are transmitted via a second data channel.

18. The method in accordance with claim 3, further comprising storing said non-time-critical data.

19. The method in accordance with claim 18, wherein said non-time-critical data is transmitted by said processing unit to said position measuring system and said storing comprises storing said transmitted non-time-critical data in a memory unit of said position measuring system.

20. The method in accordance with claim 19, further comprising storing non-time-critical data transmitted by said position measuring system in a second memory unit of said processing unit.

21. The method in accordance with claim 18, further comprising transmitting memory unit status data, which contain at least information regarding an actual memory status of a memory unit.

22. The method in accordance with claim 1, further comprising transmitting several different position request commands, which are assigned different processing priorities; and  
transmitting said up-to-date position data in accordance with said assigned different processing priorities.

23. The method in accordance with claim 3, further comprising transmitting several different position request commands, which are assigned different processing priorities; and  
transmitting said up-to-date position data in accordance with said assigned different processing priorities.

24. The method in accordance with claim 22, wherein said different processing priorities comprise:  
a first position request command used for position control, which causes said transmission of said up-to-date position data to be at the highest priority; and

a second position request command used for digitizing a workpiece contour, which causes said transmission of said up-to-date position data at a lower priority relative to said first position request command.

5           25.    The method in accordance with claim 22, further comprising interrupting transmission of position data which had been requested by a position request command of a first level of processing priority upon transmission of a position request command of a level of processing priority higher than said first level.

10           26.    The method in accordance with claim 23, wherein said different processing priorities comprise:

                  a first position request command used for position control, which causes said transmission of said up-to-date position data to be at the highest priority; and

5                   a second position request command used for digitizing a workpiece contour, which causes said transmission of said up-to-date position data at a lower priority relative to said first position request command.

20           27.    The method in accordance with claim 23, further comprising interrupting transmission of position data which had been requested by a position request command of a first level of processing priority upon transmission of a position request command of a level of processing priority higher than said first level.

25           28.    The method in accordance with claim 5, wherein with said transmitting of either of said digital data words or data packets, a data word identification is transmitted, which unequivocally identifies a beginning and type of said respective associated digital data word or data packet.

30           29.    A device for serial data transmission, comprising:  
                  a processing unit;  
                  a position measuring system, wherein position data and further data are

transmitted between said position measuring system and said processing unit in serial form as digital data words, said position measuring system comprises a control unit which, upon receipt of a position request, causes a transmission of up-to-date position data between said position measuring system and said processing unit and, following said up-to-date position data, causes transmission of further data, whose processing is not time-critical.

30. The device in accordance with claim 29, wherein said processing unit comprises a second control unit, which causes transmission of said position request command to said position measuring system for requesting position data and, following said transmission of the position request command always causes said transmission of further data, whose processing is not time-critical.

31. The device in accordance with claim 29, further comprising a single data channel for transmitting data between said position measuring system and said processing unit.

32. The device in accordance with claim 29, further comprising a first data channel and a second channel for transmitting data between said position measuring system and said processing unit, wherein said first data channel transmits data in a first direction and said second data channel transmits data in a direction opposite to said first direction.

33. The device in accordance with claim 30, wherein said position measuring system comprises a memory unit, which is used for storage of non-time-critical data transmitted by said processing unit.

34. The device in accordance with claim 30, wherein said processing unit comprises a memory unit, which is used for storage of non-time-critical data transmitted by said position measuring system.

35. The device in accordance with claim 29, wherein said control unit comprises a processor.

35. The device in accordance with claim 29, wherein said control unit comprises a processor.